

EVA-Compatible Microbial Swab Tool

When we send humans to search for life on Mars, we'll need to know what we brought with us versus what may already be there. To ensure our crewed spacecraft meet planetary protection requirements—and to protect our science from human contamination—we'll need to know whether micro-organisms are leaking/venting from our ships and spacesuits. This is easily done by swabbing external vents and suit surfaces for analysis, but requires a specialized tool for the job. Engineers at the National Aeronautics and Space Administration (NASA) recently developed an Extravehicular Activity (EVA)-compatible swab tool that can be used to sample current space suits and life support systems. Data collected now will influence Mars life support and EVA hardware early in the planning process, before design changes become difficult and expensive.

NASA's EVA swab tool pairs a Space Shuttle-era tool handle with a commercially available swab tip mounted into a custom-designed end effector. A glove-compatible release mechanism allows the handle to quickly switch between swab tips, much like a shaving razor handle can snap onto a disposable blade cartridge. Swab tips are stowed inside individual sterile containers, each fitted with a microbial filter that allows the container to equalize atmospheric pressure, but prevents cabin contaminants from rushing into the container when passing from the EVA environment into a pressurized cabin. A bank of containers arrayed inside a tool caddy allows up to six individual samples to be collected during a given spacewalk.

NASA plans to use the tool in 2016 to collect samples from various spacesuits during ground testing to determine what (if any) human-borne microbial contamination leaks from the suit under simulated thermal vacuum conditions. Next, the tool will be used on board the International Space Station to assess the types of microbial contaminants found on external environmental control and life support system vents. Data will support advanced EVA and life support system maturation studies, helping to answer questions such as “how close can an EVA-suited crew member approach an area of scientific interest without compromising the science?”